

2. OVERVIEW OF ELECTRONIC DATA INTERCHANGE

This section presents an overview of Electronic Data Interchange (EDI) and Electronic Commerce (EC), the benefits of EDI and EC, and how the Federal government currently uses these tools to conduct business.

2.1. DEFINITION OF ELECTRONIC DATA INTERCHANGE (EDI)

EDI is defined as:

"The electronic exchange of business documents (purchase orders, invoices, application forms, etc.) from one organization's computer to another organization's computer in standard data formats."

EDI is based on a set of standard formats that define transaction sets (or messages) that can be used to send basic business data from one computer to another. These transactions sets replace paper documents such as purchase orders, invoices, loan applications, and loan default reports.

EDI is not a "fax" transmission, in which unstructured data is sent from one facsimile machine to another. Fax transmissions expedite the transfer of information, yet require re-keying by the recipient before the data can be used by automated systems. It should also be noted that EDI is not electronic mail (e-mail). Though e-mail is a computer-to-computer exchange of information, the data that it contains requires editing and re-keying before it can be processed by an automated system. With EDI, the data is transmitted in a precise, structured format so that it is machine-processable without any human intervention.

2.2. DEFINITION OF ELECTRONIC COMMERCE (EC)

EC is defined as:

"The paperless exchange of business information using Electronic Data Interchange (EDI), electronic mail (E-mail), computer bulletin boards, facsimile (fax), Electronic Funds Transfer (EFT), and other similar technologies in the process of acquisition including the procurement of and payment for supplies and services."

This definition of EC is extremely broad in that it encompasses a number of electronic means to

accomplish the procurement of goods and services. However, in this document, EC has been used to denote EDI-based procurement applications.

2.3. HISTORY OF EDI

Public and private sector organizations have traditionally conducted business on paper, often using preprinted forms to exchange information with each other. Over the years, the number of these paper-based exchanges (and the amount of associated data) increased dramatically, forcing organizations to seek a more expedient way of communicating and processing business data.

EDI emerged in the late 1960's when industry groups such as railroads, airlines, motor carriers, and shipping companies realized that processing the large volume of paper documentation accompanying the shipment of goods resulted in significant delays in settlement and product deliveries. Early electronic interchanges used proprietary formats agreed upon between two trading partners (commercial entities that conduct business with each other electronically). While this was a step in the right direction, the end result was that organizations needed to maintain a different set of standards for each of their trading partners. This additional effort mitigated some of the benefits gained by conducting business electronically, and led to an agreement to jointly develop standards for EDI messages.

Since then, companies in industries of all kinds have found that EDI makes economic sense. The Data Interchange Standards Association (DISA) estimates that more than 15,000 companies around the world currently conduct business using EDI. The list of industries in which EDI is actively used includes shipping, retail, grocery, apparel manufacturing and textiles, warehousing, aerospace, chemicals, construction, automotive, financial, electrical and electronics, utilities, health care, petroleum, pharmaceutical, metals, paper, entertainment, and higher education. This list continues to grow and, in recent years, Federal, state, and local governments have begun to conduct business electronically as well. According to a recent study, the number of companies using EDI is projected to quadruple by the year 2001.

2.4. COMPONENTS OF AN EDI SYSTEM

EDI architecture is generic in that it is not dependent on any specific computer hardware, software, communications protocol, or processing environment. However, it does require that the trading partners agree upon a common set of standards and have a means for formatting their data into these standards and communicating the information to each other. The components of an EDI system include:

- ◆ EDI Standards
- ◆ Application Systems
- ◆ EDI Gateway
- ◆ Communication Network

These components and how they interact with each other in the transmission of EDI messages have been graphically depicted in Exhibit 2-1, Components of an EDI System, and are explained below.

2.4.1 EDI STANDARDS

Standards define the structure, format, and content of EDI documents, including the data fields

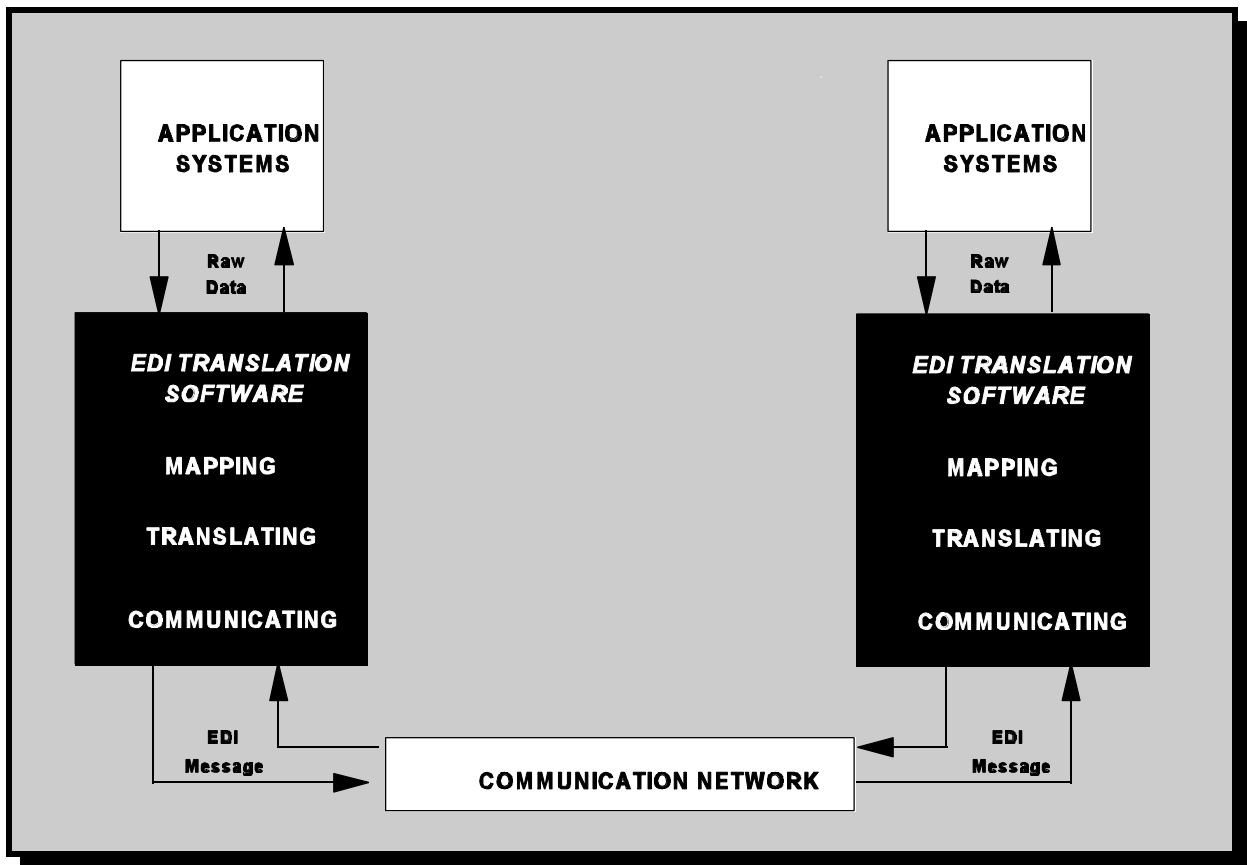


Exhibit 2-1: Components of an EDI System

that may be included in a document, the sequencing and format of fields, etc. These documents, known as transaction sets or messages, are used to exchange business information between organizations. EDI standards eliminate the need for human intervention in the interpretation of incoming and outgoing data.

Today, there are primarily two sets of EDI standards used by organizations. They are:

- ◆ **ANSI ASC X12:** ANSI ASC X12 is a set of EDI message standards developed and maintained by the American National Standards Institute, and is widely used within the U.S.

- ◆ **UN/EDIFACT:** UN/EDIFACT is a set of EDI message standards developed and maintained by the United Nations, and is widely used internationally.

2.4.2 APPLICATION SYSTEMS

Application systems are used by organizations to process business transactions. In an EDI-based application, these systems are also used to process the data to be sent to or received from trading partners. Such systems include an agency's procurement, receiving, and financial management systems, and the vendor's order management system.

2.4.3 EDI GATEWAY

The purposes of an EDI gateway are to convert application system data into a standard format and to send messages to and receive messages from trading partners. A typical EDI gateway consists of a hardware platform and EDI translation software. These two components are described below:

- ◆ **Hardware:** Consists of a host system (e.g., a personal computer, midrange computer, or mainframe computer) and communications equipment (e.g., modems and communication lines)
- ◆ **EDI Translation Software:** A specialized piece of software that performs three basic functions:

Mapping: Outgoing data is reformatted from an organization-specific format to an EDI standard format

Translating: Standard enveloping and delimiter protocols are added to the mapped data enabling the EDI message to be routed properly to a trading partner

Communicating: EDI message is sent to a trading partner via a communication network

2.4.4 COMMUNICATION NETWORK

A communication network is used in EDI to electronically transmit standard business documents between trading partners. Each communication network is typically used by a number of business entities, and often linked to other networks to enable them to transfer EDI messages to each other.

2.5. BENEFITS OF EDI

EDI helps organizations and their trading partners become more efficient, reduce transaction

costs, and improve client service. Some of the benefits of EDI include:

- ◆ **Speed:** Exchanging data electronically reduces or eliminates communication lag time between entities.
- ◆ **Elimination of Data Entry:** EDI is the computer-to-computer exchange of data and it eliminates or reduces the need for manual data entry.
- ◆ **Reduction of Errors:** EDI eliminates the possibility of data entry errors or sending documents to the wrong party.
- ◆ **Standardized Data:** By using EDI message formats, business entities can standardize the data that they exchange with each other.

Certain other consequential benefits can also be realized through an EDI implementation, such as:

- ◆ **Reduction in Costs:** EDI will eliminate manual, labor-intensive activities associated with the creation, verification, reconciliation, and handling of paper documents. In addition, the cost of postage and storage will also be eliminated.
- ◆ **Information Availability and Integrity:** Organizations will be able to provide better customer service as a result of having access to information that is more accurate and up-to-date.
- ◆ **Availability of Resources:** EDI will allow resources to be diverted from performing manual, labor-intensive activities to areas that may require additional personnel.

2.6. EDI AND EC IN THE FEDERAL GOVERNMENT

In recent years, the Federal government has become one of the largest users of EDI. Federal agencies interact not only with thousands of businesses in various industries, but with individual citizens as well. For example, the Internal Revenue Service (IRS) receives tax returns from businesses and individuals, the Department of the Treasury sends payments for goods and services to large and small businesses, and the Bureau of the Census collects statistical information from corporations. While most of these transactions currently take place via paper forms and the U.S. Mail, the Federal government is fast realizing that there are enormous cost and time savings to be gained through the implementation of electronic methods of transferring data and funds.

Actually, Federal agencies such as the Department of Defense and Department of Veterans Affairs began implementing EDI programs as early as fifteen years ago. However, the widespread use of EDI in the Federal government began fairly recently, prompted by the issuance of the final report

of the National Performance Review team and the Presidential memorandum of 1993.

The following sections provide a brief description of some significant actions taken by the Federal government to further the use of EDI.

2.6.1 THE NATIONAL PERFORMANCE REVIEW AND THE PRESIDENTIAL MEMORANDUM OF 1993

Soon after taking office, President Clinton announced that one of the priorities of his administration would be "to create a government that works better and costs less." An intensive six-month review - known as the National Performance Review - was launched with Vice President Gore leading a team comprised of staff drawn from a number of Federal agencies. In their final report, "From Red Tape to Results, Creating a Government that Works Better and Costs Less" issued in September 1993, the NPR team made a number of recommendations that focused on streamlining the Federal acquisition process. The use of EDI was prominent in this list.

In October 1993, President Clinton issued a memorandum that mandated the use of EDI and EC in the Federal acquisition process and set forth the following milestones:

- ◆ Definition of a government-wide EC system architecture by March 1994
- ◆ Establishment by Federal agencies of initial EC capabilities for electronically exchanging procurement-related documents by September 1994
- ◆ Implementation by Federal agencies of full-scale EC by July 1995
- ◆ Use of EC by the entire Federal government for the exchange of all procurement-related documents by January 1997

Currently, the Federal acquisition process involves the procurement of and payment for more than \$200 billion of goods and services consumed by the Federal government annually, through more than 2,400 procurement offices around the country. The Federal vendor community consists of 400,000 suppliers ranging from large corporations to small, single owner operations. These numbers clearly demonstrate the potential impact of the NPR team's recommendations on the use of EDI in the Federal government.

There were two other important outcomes resulting from the issuance of the presidential memorandum. First, the Electronic Commerce Acquisition Team (ECAT) was established to facilitate the implementation of EC throughout the Federal government. Second, Congress enacted the Federal Acquisition Streamlining Act in October 1994 and the Federal Acquisition Reform Act in February 1996.

2.6.2 "A SINGLE FACE TO INDUSTRY"

To assist agencies in fulfilling the mandate issued under the presidential memorandum, the ECAT Program Management Office (ECA/PMO) has established technical and functional standards to be used by both defense and civilian agencies in implementing EC. These standards will allow the government to present “a single face to industry”, and vendors who previously had to deal with each agency separately will be able to utilize a single source to learn about and respond to Federal procurement opportunities. The functional and technical measures proposed by the ECA/PMO include:

- ◆ **The Federal Acquisition Computer Network (FACNET):** FACNET is a communications network that is designed to allow Federal agencies to inform the public about federal contracting opportunities, permit electronic submission of bids and proposals, and facilitate responding to questions regarding solicitations.
- ◆ **Central Contractor Registration (CCR):** CCR is a database of registered government vendors. It also contains lists of disbarred, suspended, or ineligible vendors. CCR tracks vendor performance, and maintains this information in a location that all Federal agencies would have access.

- ◆ **Federal Implementation Conventions:** If vendors are to be able to accept and correctly interpret EDI messages from all Federal agencies, a common set of usage rules, or implementation conventions, will need to be established. To address this issue, the Office of Federal Procurement Policy (OFFP) has created the Federal EDI Standards Management Coordinating Committee (FESMCC). FESMCC has set up a number of workgroups with representatives from different agencies that are responsible for developing implementation conventions for Federal government use.

2.6.3 THE FEDERAL ACQUISITION STREAMLINING ACT (FASA) AND THE FEDERAL ACQUISITION REFORM ACT (FARA)

The Federal Acquisition Streamlining Act (FASA), passed into law in 1994, contains several reforms to the current acquisition process. It used a "carrot and stick" approach to the implementation of EC in that it raised the threshold for small purchases from \$25,000 to \$100,000 for Federal agencies that implemented EDI, as opposed to \$50,000 for agencies that did not. FASA offered Federal agencies the potential to realize significant cost savings in their procurement function, and as a result, many agencies started implementing EDI-based procurement applications.

However, due to technical difficulties in establishing the necessary government-wide technical architecture and the large number of vendors involved, many agencies experienced difficulty in meeting the target dates set forth in the Presidential Memorandum. Subsequently, in 1996, Congress enacted the Federal Acquisition Reform Act (FARA) which amended the provisions of FASA. FARA states that the threshold for simplified acquisitions will be raised to \$100,000 for all agencies until December 31, 1999. After this date the limit will be dropped to \$50,000 for agencies that have not implemented EDI programs.

While FARA has removed the element of urgency for the immediate implementation of EDI in the Federal government, most agencies have realized that EDI offers them an excellent opportunity to reduce costs and streamline their procurement process, and are continuing their efforts to implement this technology.